Possible Assembly and Test of the Crab cryomodule in SM18 at CERN

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SM18 Presentation

- 2 x 15 meters grey-white room with rail
- 1 canopy for pieces conditioning
- 2 horizontal radiation-safe bunkers
  - First one fed by 352 MHz 300kW cw klystron
  - Second one fed by 400 MHz 300kW cw klystron
  - But :
    - Demineralized water capacity a bit short for parallel operation
    - Not equipped for 2 Kelvin
    - Limited Cryogens availability

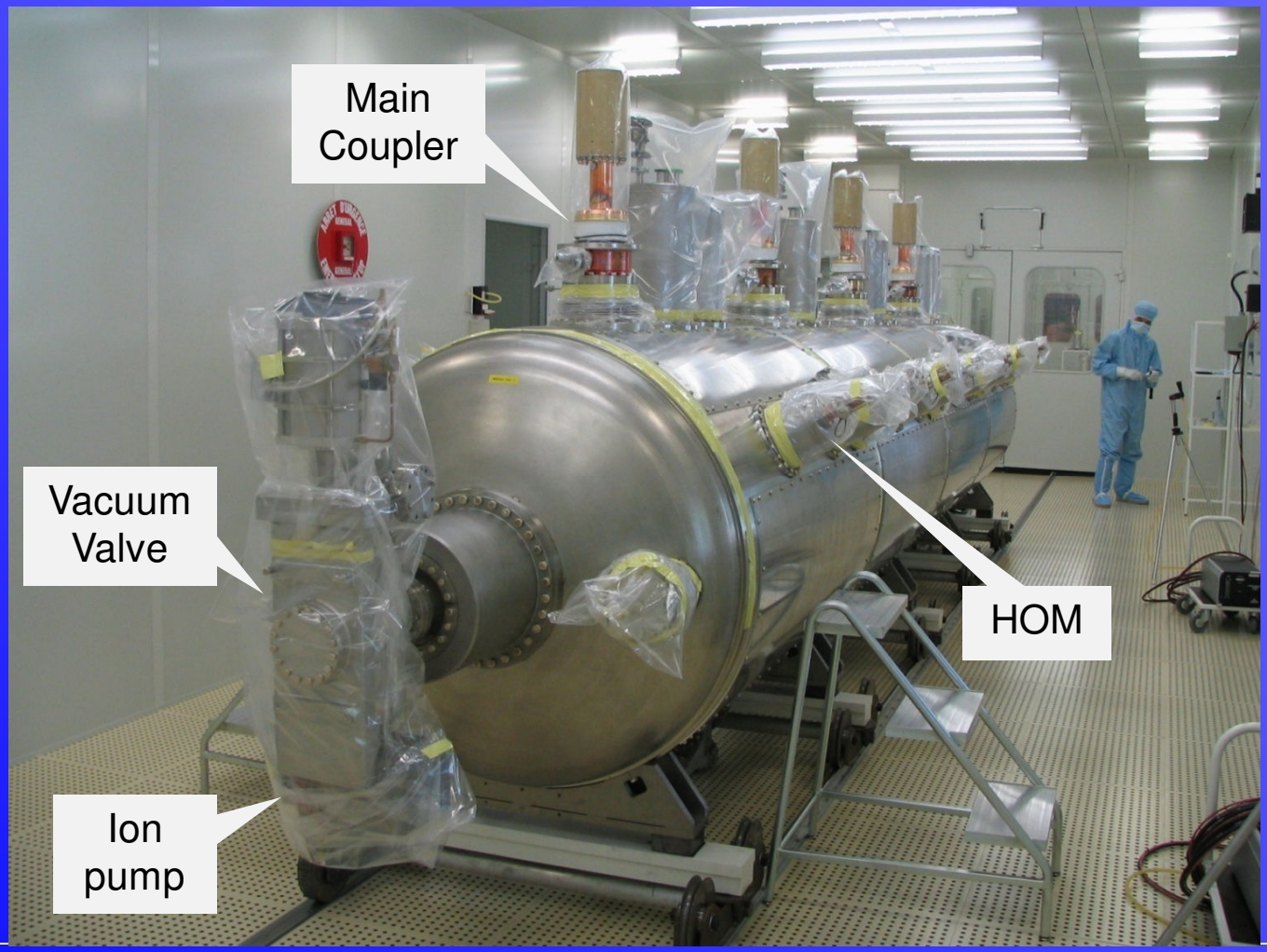
Transport

- Transport from pumping after last cavity rinsing under vacuum
- Need to develop a bogie system for the cryomodule assembly in clean room
- As transport of the fully equipped cryostat is more critical then a single bare cavity, let's do the assembling and final test here at CERN
- Transfer from SM18 to PT4 at low speed with G shock logging system

Rail & supporting frame

Assembly in clean room

- 30 meters long in 2 x 15 meters Class 1000 then 10

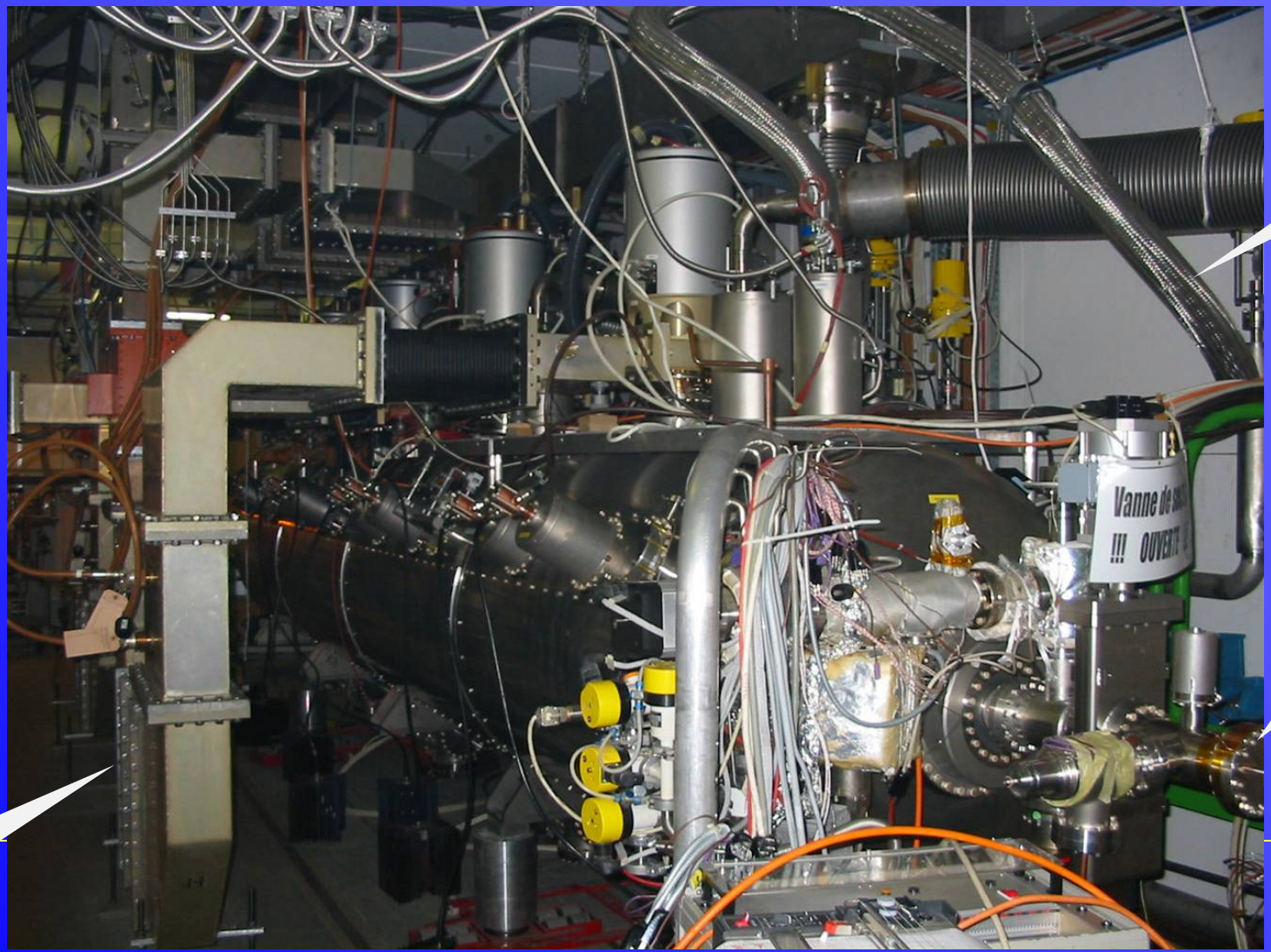


Vacuum connection & leak detection

- As for the vertical test great care for the vacuum manipulations is mandatory !
  - Low speed oil free vacuum pumping system
  - Each operation in clean room followed by pumping and leak detection
  - All metallic joints around cold parts
  - Penning gauge near coupler

Horizontal Bunkers

- Transfer of modules to radiation safe bunker
- Connections with cryogenic lines, RF, controls, e- stoppers



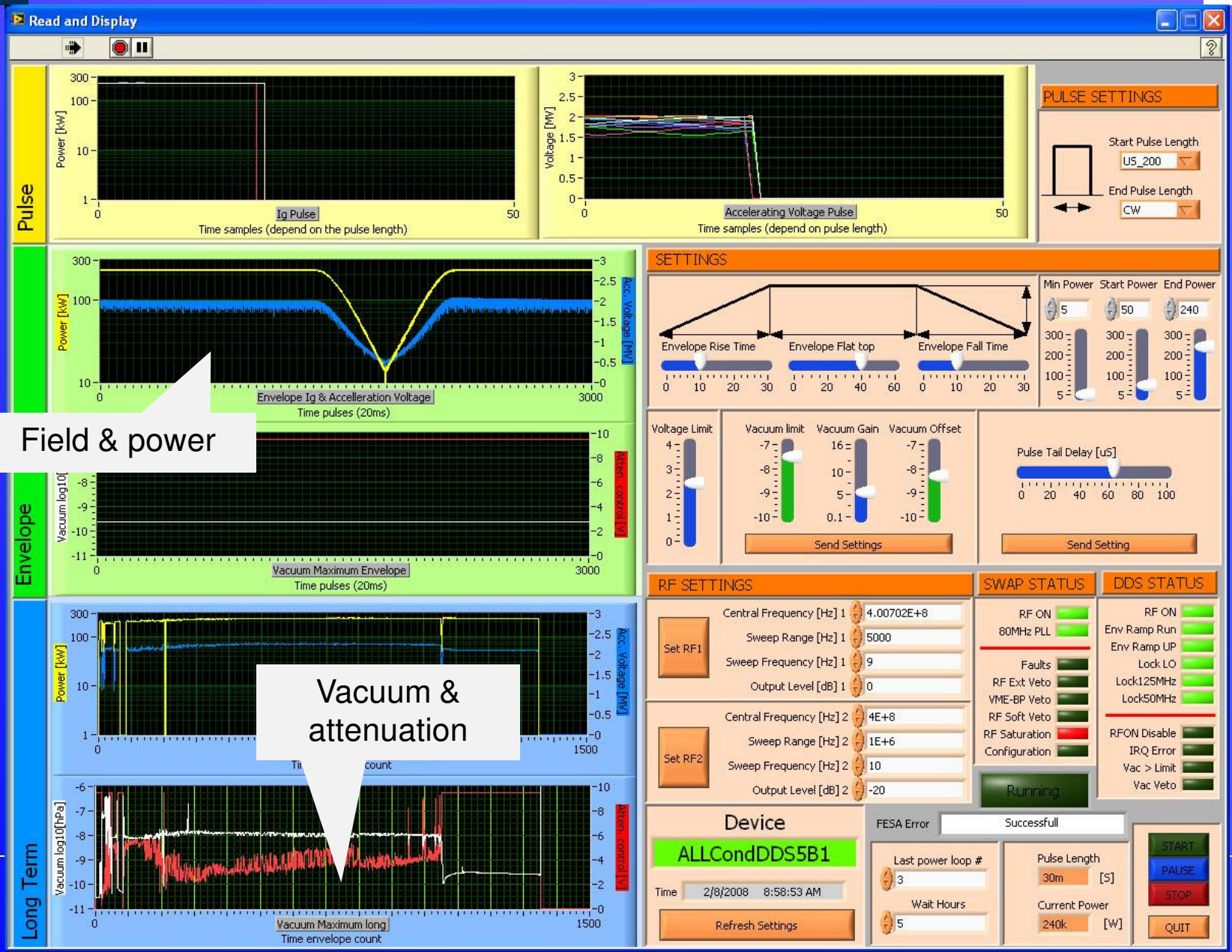
Cool down & Warm up

- Cryo operation became difficult with ageing ABB control interface and ageing instrumentation…
- As
  - We share the He distribution with the LHC magnet test stand (2000 elements in machine) !
  - Since spring 2007 the SM18 cryo-plant capacity went down to 22 g/sec
  - Old RF transfer line consumes already 8 g/sec…
- There is a limited cryogens availability for SC serial tests !

Low power measurements

- Loaded Q, tuning range, HOMs measurements
- Antenna calibration
- And before power feeding
- Dedicated Interlocks installation & full check
  - Main couplers very sensible !
  - Remember : in case of ceramic break down, pollution of the whole module to be dismantled !
  - Fast RF shut off with vacuum increase, arc detection in WG, He pressure raise, RP alarm, RF zone access etc.

Conditioning up to max field



Summary & Conclusion

- Assembly is possible in SM18 clean rooms

- BUT for the power validation
- The Cryo-installation must be upgraded if operation at 2 kelvin (as documented in FP7 proposal Dec 2007)
- Need to buy and install an 800 MHz 60 kW cw RF amplifier beside the 400 MHz klystron
- (Quid of the new SPS 800 MHz amplifier ?)

Summary & Conclusion

- As the 352 MHz bunker will be modified into pulse mode to be used for Linac 4 and SPL study at 704 MHz
- Although the 400 MHz test stand must be kept in good shape for the LHC life time !
- Crab cryomodule will have to share the LHC horizontal test Stand -> to be discussed